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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/731,659	12/09/2003	Arvind Halliyal	AF01196	4948
45305	7590	03/08/2005	EXAMINER	
RENNER, OTTO, BOISSELLE & SKLAR, LLP (AMDS)			LE, THAO P	
1621 EUCLID AVE - 19TH FLOOR			ART UNIT	
CLEVELAND, OH 44115-2191			PAPER NUMBER	
			2818	

DATE MAILED: 03/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/731,659	Applicant(s) HALLIYAL ET AL.	
	Examiner Thao P. Le	Art Unit 2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>2 pages</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Claims 1-20 are pending.

Information Disclosure Statement

2. Information Disclosure Statement (IDS) filed on **03/24/04** and made of record.

The references cited on the PTOL 1449 form have been considered.

Claim Rejections

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

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Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

4. Claims 1-20 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-20 of co-pending application serial number 10/731,494. Although the conflicting claims are not identical, they are not patentably distinct from each other because Claims 1-20 of pending application serial number 10/731,494 include all limitations cited in claims 1-20 of present application, and the spacer layer in the pending application serial number 10/731,494 would have been nitride layer in present application because both layers carrying out the same function and having the same content of atoms.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent,

except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1-3, 10-13 are rejected under 35 USC 102 (e) as being anticipated by Shiraiwa et al., U.S. Patent No. 6,740,605.

Regarding claim 1, Shiraiwa et al. discloses a process for fabricating a semiconductor device having a ONO structure 26 similar to what recited in claim 1, See Figs. 1-12 and Cols. 1-18, the process comprising: providing a semiconductor substrate 16, forming on the semiconductor substrate an oxide layer, depositing on the bottom oxide layer 28 a nitride layer 30 (Fig. 1, Cols. 4-5), the nitride layer having a first hydrogen content (Figs. 11-12), applying a treatment to reduce the first hydrogen content to a second hydrogen content (annealing, Figs. 11-12).

Regarding claims 2, 11, Shiraiwa et al. discloses wherein the treatment comprise one or more of RTO oxidation of at least a portion of charge trapping dielectric layer in an oxidizing atmosphere, ISSG oxidation, free radical oxidation, decoupled plasma, and steam oxidation of at least a portion of the charge trapping dielectric layer (lines 20-67, Col. 11).

Regarding claims 3, 12, Shiraiwa et al. discloses the first hydrogen content is in a range from greater than about 2 atomic percent to about 30 atomic percent (lines 65-67, Col. 10).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. **Claims 4-9, 13-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over by Shiraiwa et al., U.S. Patent No. 6,740,605.**

Regarding claims 4-6, 13-15, 19-20, Shiraiwa et al. discloses the charge layer having a first hydrogen content of about 3 atomic percent to 30 atomic percent and the charge trapping dielectric layer is also under further treatment to reduce the hydrogen content. It would have been obvious to one having ordinary skill in the art that the hydrogen content in the charge trapping dielectric layer would have to be less than 3 percent and since the hydrogen content in the charge trapping dielectric layer is too low, the hydrogen content can not be detected by FTIR (Fourier transform infra-red), so there is not FTIR spectrum (around 450 and 1300).

Regarding claims 7-9, 16-18, Shiraiwa et al. discloses the hydrogen might migrate into the bottom oxide layer or a top oxide layer formed on the charge trapping dielectric layer, however, the hydrogen in the oxide layers is negatively affect performance of the charge storage dielectric memory device (Cols. 5-6), and the

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hydrogen in oxide layer would replace with different atom in later treatments. It would have been obvious to one having ordinary skill in the art that the hydrogen is prevented to exist in the oxide layer and the ONO layer is formed using low-hydrogen starting materials in order to reduce the number of hydrogen contaminate in ONO layer as disclosed in Shiraiwa.

9. When responding to the office action, Applicants' are advice to provide the examiner with the line numbers and page numbers in the application and/or references cited to assist the examiner to locate the appropriate paragraphs.

A shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) day from the day of this letter. Failure to respond within the period for response will cause the application to become abandoned (see M.P.E.P 710.02(b)).

10. The other references cited in PTO-892 also disclose the present invention including the limitations of forming a ONO structure, the ONO structure is contaminated with hydrogen, and applying treatments to reduce the hydrogen content in ONO structure.

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao P. Le whose telephone number is 571-272-1785. The examiner can normally be reached on M-T (7-6).

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on 571-272-1787. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Thao P. Le'.

Thao P. Le
Examiner
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